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## HOTEL

### 7.1 – CALCULATION OF THE STAIRCASE

DIPLOMA THESIS  
DIPLOMOVÁ PRÁCE

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## 1. Input data

Construction height of the floor:	3920 mm
Width range of the tread:	[210,300] mm
Height range of the riser:	[150,180] mm
Lehman's formula's result range:	[600,650] mm
Width of the staircase flight:	1500 mm

## 2. Calculation

### Determination of number of steps

$$n_p = \frac{H_c}{h_i} = \frac{3920}{165} = 23.76 \text{ steps}$$

Where:  $n_p$  – preliminary number of steps

$H_c$  – construction height

$h_i$  – height of the ideal step

### Choice of the number of steps

$n_d = 24$  steps

$$h_s = \frac{H_c}{n_d} = \frac{3920}{24} = 163.33 \text{ mm}$$

Where:  $h_s$  – height of riser

$H_c$  – construction height

$n_d$  – number of designed steps

### Calculation of the width of tread

$$b_1 = 610 - 2 * h_s = 610 - 2 * 163.33 = 283.33 \text{ mm}$$

$$b_2 = 650 - 2 * h_s = 650 - 2 * 163.33 = 323.33 \text{ mm}$$

Where:  $b_1$  – lower condition boundary

$b_2$  – upper condition boundary

### Choice of the width of tread

$$b = 300 \text{ mm}$$

### Calculation of the slope

$$\alpha = \tan^{-1} \frac{164}{300} = 27.9^\circ$$

### Calculation of the passage height

$$H = 750 + 1500 * \cos \alpha = 750 + 1500 * \cos 27.9 = 2076 \text{ mm}$$

Minimal required passage height is 1950 mm: staircase **complies** with the requirements.

## 3. Conclusion

Staircase flight is a pre-made concrete piece. Designed width of stairs is 1500 mm. Number of stairs is 24. Calculated width of tread is 300 mm which is in limits, height is 164 mm that is in limits as well. The slope of the staircase is  $27.9^\circ$ . All dimensions are adapted as much as possible to barrier-free requirement of an optimal size of tread of 300 mm and slope of  $28^\circ$ .